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Proceedings of the North Slope Dolly Varden RAP Meeting.

Compte rendu de la réunion du PCR sur l'état des stocks de Dolly Varden du versant nord.

6-7 November 2002
Midnight Sun Recreational Centre, Inuvik, NT

Susan E. Cosens and Kathleen A. Martin, Chairpersons

Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB
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Abstract

Participants from Fisheries and Oceans Canada, Fisheries Joint Management Committee, Aklavik Hunters and Trappers Committee, West Side Working Group and Parks Canada met in Inuvik on November 6-7, 2002 to participate in the Regional Advisory Process (RAP) meeting on the stock status of the Big Fish River, Babbage River and Firth River Dolly Varden stocks. The purpose of the RAP was to review both scientific data and traditional knowledge available for these stocks. Working papers were tabled and an overview of six of these papers was presented for discussion. The three river systems are found in an area of overlapping jurisdictions (Inuvialuit Settlement Area, Yukon Territory, and Northwest Territories). Two rivers are within the boundaries of Ivvavik National Park, and one system has its headwaters in Alaska. Co-management responsibilities are described in the Inuvialuit Final Agreement (IFA 1984).

The North Slope Dolly Varden stocks are important to the Inuvialuit for subsistence use. The over-wintering and spawning sites known as "Fish Holes" are extremely significant for fish survival and are sensitive to disturbance. The Firth and Babbage River systems are relatively unexploited. By comparison, the size of the Big Fish River stock has been reduced and has not shown any sign of recovery since the river was closed to fishing in 1987. A mixed stock fishery along the coast of the Beaufort Sea has continued, but the extent to which it affects each of the stocks is unknown. The amount of mixing and the migratory behaviour of the stocks during the open-water season are not well studied. Recent habitat changes, particularly on the Big Fish River, may have altered or reduced the amount of critical over-wintering habitat, limiting the potential recovery of this stock. Continued protection of these fish in the river systems is warranted and further research during the summer season when stock mixing occurs would be beneficial to management initiatives intended to conserve the stocks.

Résumé

Des représentants de Pêches et Océans, du Comité mixte de gestion de la pêche, du comité des chasseurs et trappeurs d'Aklavik, du Groupe de travail de la côte Ouest et de Parcs Canada se sont rencontrés à Inuvik les 6 et 7 novembre 2002 pour prendre part à la réunion portant sur le processus de consultation régionale sur l'état des stocks de Dolly Varden dans les rivières Big Fish, Babbage et Firth. Le processus de consultation régionale avait pour but d'examiner aussi bien les données scientifiques que les connaissances ancestrales disponibles pour ces stocks. On a présenté des documents de travail et fait un survol de six d'entre eux aux fins de discussion. Les trois rivières se trouvent dans un secteur qui relève de trois administrations différentes (région désignée des Inuvialuit, le Territoire du Yukon et les Territoires du Nord-Ouest.). Deux des rivières s'écoulent dans les limites du parc national Ivvavik et la troisième a sa source en Alaska. Les responsabilités de cogestion sont décrites dans la Convention définitive des Inuvialuit (CDI 1984).

Les stocks de Dolly Varden du versant nord sont essentiels aux Inuvialuit pour qui il s'agit d'une denrée de subsistance. Les lieux d'hivernage et les sites de frai, appelés «fosses à poissons», sont indispensables à la survie des poissons et sont sensibles aux perturbations. Les rivières Firth et Babbage sont relativement sous-exploitées. En comparaison, la grandeur du stock de la rivière Big Fish a décliné et n'a montré aucun signe de rétablissement depuis que la pêche est interdite dans la rivière en 1987. Une pêche de stocks mélangés le long de la côte de la mer de Beaufort s'est poursuivie, mais le degré des répercussions sur chacun des stocks n'est pas connu. On ne connaît pas bien non plus le degré de mélange et le comportement migratoire des stocks durant la saison d'eau libre. Il se peut que des changements récents de l'habitat, en particulier dans la rivière Big Fish, aient modifié ou réduit le montant critique d'habitat d'hivernage, limitant ainsi le rétablissement potentiel du stock. Les efforts soutenus de protection de ces poissons dans les rivières est garanti et une recherche approfondie pendant la saison estivale, au moment du mélange des stocks, seraient bénéfiques aux mesures de gestion visant la conservation des stocks.

Introduction

The Regional Advisory Process (RAP) meeting to evaluate the status of the Big Fish River, Babbage River and Firth River Dolly Varden stocks was held at the Midnight Sun Recreational Centre in Inuvik on November 6 and 7, 2002. Participants included personnel from Fisheries and Oceans Canada (DFO) Science, DFO Fisheries Management, the Fisheries Joint Management Committee (FJMC), the Aklavik HTC, Parks Canada and a former DFO employee, currently working with the Ontario Ministry of Natural Resources, who worked on Dolly Varden from two of the three rivers under review (Appendix 1). Several participants were also members of the West Side Working Group which was established to coordinate the development of a new community-driven integrated fisheries management plan for the fish resources in streams and rivers within the Inuvialuit Settlement Region west of the McKenzie River to the Alaskan border.

The meeting began at 8:35 with an opening prayer given by Danny C. Gordon. Susan Cosens (co-chair), head of Stock Assessment and Conservation Research, part of the Arctic Science Division of DFO, welcomed participants. She then provided a brief description of the principles, guidelines, objectives, and intended products of the Regional Advisory Process, following the summary provided in the document "What is *RAP*?" (Appendix 2). A remit (Appendix 3) and the proposed agenda (Appendix 4) had been sent to all participants prior to the meeting. A complete list of Working Papers for the meeting is provided in Appendix 5.

Participants were asked to introduce themselves. The Chair then outlined the agenda for the day. She encouraged all participants to join in the discussions, with the projected outcome for the day being the completion of the Stock Status Report (SSR) for the Big Fish River. The goal of the second day of the meeting was to finalize the discussions of the Big Fish River Dolly Varden and complete the review of both the Babbage and Firth river stocks. The second day of the meeting was to be chaired by Kathleen Martin.

Burton Ayles provided a brief overview of the West Side Working Group (WSWG), which was jointly established in 2001 by FJMC, DFO, Parks Canada and the Aklavik HTC. The purpose of the working group was to provide an objective-based fisheries management plan for the most important fish species in streams west of the Mackenzie River within the Inuvialuit Settlement Region. The first step in the process was to assemble all known information. A traditional ecological knowledge study was initiated (Working Paper # 1). A Big Fish River Habitat Inventory Project was carried out to provide some habitat information. DFO Science began a compilation of scientific information on the Dolly Varden (Working Papers # 2-4 and draft SSRs). The RAP meeting and resulting SSRs for the Dolly Varden stocks will be part of the data compilation process. After the information is assembled, the WSWG will use the information to establish conservation limits and set fisheries management objectives for the stocks. Note that "West Side" and "North Slope" refer to the same geographic location, but use different reference points. 'West Side" refers to the area west of the Mackenzie River and "North Slope" refers to the northern coastline and inshore area of the Yukon Territory.

The Proceedings summarize the working papers presented at the meeting and then outline the discussions of the draft SSRs. The three working papers (WP#2, WP#3, and WP#4) authored by J.B. Eddy, J.D. Reist, and C.L. Evans were provided to all participants and summarize the information known about the North Slope Dolly Varden prior to 2001. These working papers were used to develop the draft SSRs, which were the basis for discussion by participants at the meeting. Revisions to these SSRs will be finalized following the meeting and will become the published versions of the SSRs.

Working Paper Summaries

Working paper # 9: Micro-PIXE analysis of strontium and zinc

To begin the review of the species biology, an overview of Micro-PIXE (Particle Induced X-ray Emission) analysis of strontium and zinc distributions in Dolly Varden (*Salvelinus malma*) otoliths was presented (working paper # 9). Each growing season, calcium is deposited on the outer margin of bony structures such as otoliths. These deposits form in concentric rings and a distinct yearly marker forms at the beginning of each new growth season. This marker is counted to age the fish. Along with calcium, other trace elements, including Strontium (Sr) and Zinc (Zn), are deposited within the otoliths. Strontium is taken up by the body as the fish breathes. Sr is lacking in freshwater but high concentrations are found in seawater, so that the pattern of Sr concentrations within the otoliths can be used to tell when the fish spent time in the sea. Zn, another trace element detected in otoliths, is an indicator of feeding. Zn concentrations decrease in early fall when feeding effort is reduced and remain low throughout the winter. Concentrations of Zn are higher when fish are feeding heavily. Concentrations are also expected to decline when the fish spawn, because Zn is thought to be diverted to the development of reproductive tissues.

By using a scanning proton micro-probe directed at sectioned otoliths, concentrations of Sr and Zn were measured and life history information was determined. Initial analysis of Dolly Varden otoliths, principally from fish occupying the rivers in Ivvavik National Park, indicates variation in life history patterns among fish. Non-migratory, resident fish maintained low levels of Sr throughout their entire life, as was expected. In anadromous Dolly Varden, various patterns of Sr deposition were found. For example, one fish went to sea during its third summer for three summers in a row and then spent two years in freshwater. Not all fish went out to sea on an annual basis. Fish from Joe Creek went to sea in their third summer, while those from the Firth River went to sea in their fourth summer. Resource users do not normally access the streams during the summer, and have been unable to confirm whether large anadromous individuals are in freshwater throughout the summer. However, Steve Sandstrom has found large fish in the Big Fish River fish hole during the summer.

Questions are still raised about the frequency at which Dolly Varden spawn. Work on Arctic char (*Salvelinus alpinus*) by L. Johnson has indicated that, in general,

anadromous char spawned every second year. Initial analysis of Zn levels suggested that Dolly Varden vary in this life history strategy. One individual appeared to have spawned three times between age 6 and 12. Based on Sr and Zn concentrations in the same otoliths, there is an indication that some fish remain in freshwater the year they spawn, while some fish spawn the same year they go to sea. Preliminary analysis suggests that there is also the potential to identify the home stream of an individual fish because the Sr signature between spawning sites may be different. This technique could potentially provide information on species biology and fisheries management.

Working Paper # 1: Traditional Ecological Knowledge Fishing Study (TEKFS)

This study was done in February and March of 2002. The oral history of elders and resource users relating to the fish resources of the area, from the 1920s to the present, was documented through a series of interviews held in Aklavik and Inuvik. Changes in where people live have had a major impact on fishing activities. In the 1930s, people lived and fished along the coast and on Herschel Island. By the 1960s, most were based in Aklavik. In the 1990s, much of the fishing was taking place in the delta at Shingle Point and Running River. Recently, coastal fishing has become popular again for some residents of Aklavik. Beginning in the 1980s, changes in water level and water chemistry have occurred along the coast. The Firth River and Babbage River were fished to a limited extent. The Big Fish River Fish Hole was fished by both the Gwich'in and Inuvialuit. A major decline in the fishery was noted in the early 1980s. Although there had always been good and bad years for fishing, fishing became poor in all years. Shoreline erosion and lower water levels were habitat changes noted during the study, along with changes in the taste of the water. Resource users were concerned about the change in fish populations and the potential effects of oil and gas development. The study did not document the number of fish taken from the Big Fish, but it noted that large numbers of fish (3000 to 6000) had been removed from the system.

The draft TEKFS report seems to suggest that char were fed to dogs. This is not correct. A participant clarified that Dolly Varden caught in the Big Fish River in early years were carried out by dog teams. The teams may have been fed some Dolly Varden while they were at the fish hole, but these fish were, for the most part, used for human consumption. Whitefish, when available, were fed to the dogs.

Although participants reviewed a working draft of the TEKFS report, citations in the SSRs refer to the final published version of the report.

Working Paper # 7: Big Fish River, 1972-1994

A summary of studies carried out on the Big Fish River between 1972 and 1994 was presented to participants. Dolly Varden from the Big Fish River were fished, along the coast in a mixed stock fishery, at the mouth (Moose Channel) and at Fish Hole. In 1972, 8000 to 10000 Dolly Varden were removed from the river. Since then, fishing success has declined, and fewer fish have been harvested from the river. The community closed the river to fishing between 1987 and 1992, and then

reopened the river with a small quota in 1992. Fishing continued along the coast throughout this time period, including when the river was closed to fishing. Between 1990 and 1999, approximately 200 Dolly Varden were harvested annually along the shore at Shingle Point. Up to half of these fish may have been from the Big Fish River. Large numbers of fish were tagged in the 1990s, and the results indicate no significant movement between systems occurred. In general, the fish returned to the systems they were tagged in, and there appeared to be little intermixing of stocks overwinter. Although the Fish Hole is quite small, large numbers of both Dolly Varden and Arctic grayling overwinter in the area. Mean size of fish increased from the 1980s to the 1990s, suggesting some stock recovery.

Changes in freshwater habitat have occurred. Geological activity may have reduced water flow at the over-wintering site. Earthquakes (magnitude 2.3, 3.4 and 2.6) occurred in 1970, 1977 and 1986 in this area. In addition, high shale banks are subject to erosion, and could produce high sediment loads which may lead to loss of spawning habitat. In the Big Fish River, Dolly Varden spawn farther from the groundwater discharge than they do in other rivers. As a result, the eggs are subjected to more unstable incubation temperatures, which may result in temperature-induced egg mortality. Lower flow rates would tend to exacerbate this situation. Temperature spikes as high as 8-10 °C in a day have been recorded. Hatching time varied, with eggs from some sites (above cabin) hatching about two months earlier than those at others, likely due to differences in the water temperature at the sites.

The sex ratio in the Big Fish was skewed, with 40% of the males not being subject to the fishery (resident males). The fishery tended to remove the larger fish, and these were often prime breeders. For example, large males are susceptible to all sizes of nets. In both the Rat River and Big Fish River, 80% of spawners were females and 20% were males. Although resident males made up a large proportion of the spawners in the Big Fish River, large males are still needed to stimulate spawning.

As part of the research covered by this report, a comparison was made between fish from the Babbage and Big Fish River stocks. Reproductive biology differs between the streams. Big Fish River females were smaller by 20-30 mm than those from the Babbage River at any given age. Babbage river females spawn one year later than those in the Big Fish River. The age-at-first-maturity (50% mature) was 5 in the Babbage and 6 in the Big Fish River. Once females in the Big Fish River were mature, few were resting, and few were found to be larger than 420 mm. In the Babbage, 30% of the females greater than 420 mm were resting. This suggests that Big Fish River Dolly Varden are sequential spawners. In the Big Fish River, larger fish produced fewer but larger eggs. In a survival study, large eggs had a higher survival rate. Removing large females from the system could have consequences for the population.

Working Paper # 5: Big Fish River, 1995-present

This report summarizes information from 1995 to the present on the Big Fish River. Early tagging work suggested that 50% of the Dolly Varden caught at Shingle Point came from the Big Fish River. Harvest information from 2001 and 2002 from the mixed stock coastal fishery was not reported. There was no evidence for cannibalism from diet studies. Within the Big Fish River itself, the population continued to decline, even after the closure of the fishery. Old fish have become extremely rare, and more effort is required to catch fewer fish. The number of young-of-the-year (YOY) Dolly Varden observed in the river varies between years, but appears to have declined since 1998. Habitat changes, such as erosion and low water levels, were noted and could be more important than fishing pressure for preventing stock recovery.

Discussions focused on the variability observed in reproductive success and year class survival. There appear to have been several recent years with high levels of reproduction, which may correlate with warmer (El Niño) years. However, low spawning success and low year class survival seems to have occurred in most years. Sedimentation seems to be quite high in the river, possibly burying redds and reducing the survival of eggs and fry.

Working Paper # 8: Genetic Stock Structure Evidence

Genetic analyses, used to differentiate stocks between and within river systems in this study, were based on allozyme, mitochondrial DNA or microsatellite data. Fish in different drainage systems were genetically distinct from one another, and non-migratory residents, isolated by a physical barrier such as a waterfall, were genetically distinct from anadromous fish within the same river. The techniques were unable to identify any genetic differences between life history types. Reassignment of fish to natal waters had varied success with individuals from isolated resident populations being reassigned with greater confidence levels than those from anadromous populations.

Mitochondrial and microsatellite DNA showed a trend in which westerly populations had a much higher level of variability than those towards the east. Fish from the Firth, Babbage, Big Fish and Rat river drainages were significantly different, based on pair-wise genetic differentiation tests. Few or no differences were seen among anadromous fish within these drainages. Mitochondrial and microsatellite data could potentially be used to identify stock origins of fish caught in mixed-stock fisheries in the Beaufort Sea.

Working Paper # 10: Analysis of morphological data

Adaptations that are important for survival and recruitment may produce phenotypic (expressed) variation in life history, morphology, meristics, size or other measurable traits among populations, although not all phenotypic variation has a genetic basis. If populations are isolated from each other, they may adapt in different ways to their environment and develop distinguishable differences in

morphology or meristics. Morphological measurements (or morphometrics) are length-based measures of specific body parts, such as total length of the body or diameter of the eye, which describe the overall shape of things. Meristics are counts of structures that occur more than once in a fish, such as the number of fin rays or gill rakers. Both were examined to compare Dolly Varden collected from the Firth, Babbage, Big Fish and Rat Rivers using two multivariate statistical procedures; principal component analysis (PCA) and discriminant analysis (DA). The body shape of juveniles and smolts may differ significantly from that of adult fish, so the morphometric data were filtered to include only adult anadromous fish.

Analysis of the morphometric data suggests that distinct stocks of Dolly Varden are found in the Firth River, Babbage River and the Big Fish River systems as well as in the Rat River system. In terms of morphology, fish from the Rat River most closely resemble fish from the Babbage River. Fish from the Rat River system do not differ to any greater degree from fish from the North Slope systems than from each other.

Only the Firth River system appears to support more than one stock of anadromous Dolly Varden; one stock from the upper reaches of the Firth River, the other from Joe Creek. The Babbage River, Big Fish River and Rat Rivers each appear to support a single stock of anadromous Dolly Varden.

In the discussion following the summary, a figure showing the relationship between the caudal peduncle length and migration distance provided an example of the functional relationship between morphometrics and the environment.

The Big Fish River Stock Status Report

Background

The Inuvialuit name and spelling for Dolly Varden, *iqaluqpiq*, was confirmed. The presence of isolated stock should be noted in the species biology, not in the background information, since they are only dealt with briefly in the report. Participants felt that the emphasis on the commercial fishery was misleading and should be removed. The over-wintering area should simply be referred to as "Fish Hole". How the closure came about is detailed in working paper # 7, and should be included here. All management partners need to be added to this section along with a reference to the WSWG and mention of the Inuvialuit Final Agreement. The reference used for the Traditional Ecological Knowledge Fishing Study was Papik and Marschke (2002) which was later updated to Papik *et al.* (2003).

Map

A great deal of discussion centered on the map that was to be added to the SSR. Participants from Aklavik pointed out that there was no Fish Hole on Cache Creek. Locally, the Fish Hole is considered to be on a branch of the Big Fish River called Little Fish River. There is another small creek, called Cache Creek, in the area, which freezes solid. It was noted that we should use the local names, but must

also include references to the names referred to in other reports. Participants agreed that more details should be added to the map, including both Cache Creeks (Little Fish River), fishing sites (Fish Hole, weir, mouth, delta, Shingle Point, Ptarmigan Bay), the falls, location of the isolated population above the falls, boundaries (Inuvialuit Settlement Region, Gwich'in Settlement area) and Aklavik. The map itself should be taken from a topographic sheet with an accurate direction marker. Specific sites should have the latitude and longitude in the body of the text (i.e. Fish Hole – 68° 18' 08'N, 136° 20' 32.7" W) to avoid the confusion over tributary names. As soon as the map is available it should be sent back to the participants for review.

Species biology

Participants felt that the biology of the species was better described in the Rat River Stock Status Report, and should replace some of the information in the draft Big Fish River document. One participant wondered about how Fish Creek and the Dolly Varden in it should be treated during the review. Located west of the Firth River near the Alaska/Yukon border, Fish Creek has been referred to in some older literature, however there has been no work done on it recently, and, as a result, it has not been included in the list of rivers that support genetic stocks of Dolly Varden. Participants pointed out that the list of stocks should be the same in all three SSRs.

Older literature refers to the species of char in the streams under investigation as Arctic char (*Salvelinus alpinus*), and only recently (Reist *et al.* 1997) have these fish been identified as Dolly Varden. The species occurring in the streams has not changed, only our understanding of their taxonomy, and this information has to be included somewhere in the text. Older literature, referring to Arctic char in the streams being discussed at this meeting, is referring to Dolly Varden. The occurrence of populations that are unable to go to sea because of a physical barrier (falls) should be noted. Even though they are not discussed in any detail, they do provide a source of genetic material to the population below the falls, although the exchange of material is one-way. The term "isolated" should be used rather than "land-locked", which is more accurate for Arctic char in lacustrine environments. The section should be rearranged to include a description of how the fish look, a summary of their life history stages, and a description of their habitat. Data specific to the Big Fish River stock, such as the age-at-first-maturity and hatching times, should be used when available, rather than using the average for the species. Hatching time varied between sites on the Big Fish River, and occurred approximately two months earlier at the warmest known spawning sites (Sandstrom unpublished data). Egg size in general was larger for females in the Big Fish River, and was correlated with fish length (Sandstrom 1995). Larger eggs had much higher survival rates than smaller eggs (Sandstrom unpublished data). Revised length at age data should be presented in this section rather than under stock trends.

It was noted that ages for the majority of the work reported here for Dolly Varden were determined by the "whole otolith" method, where the otolith was viewed and

ages were interpreted from the lateral (outer) side. It has been shown for other species, including the closely related Arctic char, that this method provides accurate ages only up to about 9-10 years of age, after which a phenomenon known as "capping" occurs. Subsequent annuli are laid down only on the medial (inner) side of the otolith and are not visible from the lateral side. Determining ages from a thin transverse section of the otolith in which all annuli are visible was used for the Dolly Varden micro-PIXE work. There are many Dolly Varden otoliths, archived at the Freshwater Institute (DFO – Winnipeg), which have been aged using the whole otolith method, and which could now be sectioned and re-aged to compare the two methods. Interpretation of age-related data should consider the aging method used, and comparisons should be made with caution when methods differ.

Description of Habitat

Habitat issues are important in the discussion of Dolly Varden in the Big Fish River, and it was felt that it warranted a separate section. A note regarding the Cache Creek / Little Fish Creek name should be made here. The name of Cache Creek should be removed, where possible, to avoid further confusion.

The Fishery

Historical harvest

It was noted that the information on the commercial harvest was misleading and should be removed. The term 'domestic' should be changed to 'subsistence'. A table should replace the figure in the draft version to reflect what was measured. Table 1 should be referenced in this section and should combine the known harvest information with reference to the sources of data. Concern was expressed that catch per unit effort was never measured so the total harvest is not necessarily a measure of the decline in the population size. Fishers, however, agree that catch per unit effort has declined and a personal communication citation should be included here (Danny C. Gordon) to reflect this. Continual harvesting occurred in the mixed stock fishery even when the river itself was closed to fishing. It was pointed out that the quota set for the Big Fish River was for the stock, not just for the fish caught in the river itself. The proportion of Big Fish River stock making up the catch at Shingle Point may have declined as the stock size became smaller. Fishers noted that fewer fish of all species are now being caught at Shingle Point.

Current harvest

Include Table 1 (revised from working paper # 5 to include earlier harvest information). Mesh size information should be removed. Length–frequency histograms comparing subsistence harvest and survey information should be included as Figure 2 to reflect the proportion of larger fish removed by the fishery. Participants noted that there were a number of fishers actively fishing in the area around Herschel Island this past summer. Most of this harvest is not being reported. Shingle Point is not the best area to fish for Dolly Varden.

View of Fishers

This section was drafted by the members of the WSWG and was to include a summary of the importance of the fishery to local people.

Resource Status

Stock Delineation

The genetics working paper and morphometric working paper are both relevant to the question of stock delineation and should be referenced here along with the supporting evidence from the strontium levels in otoliths. The isolated population's relationship to the other life history forms in the river should also be referenced.

Stock Size

Participants wanted the population data to be included, but there was concern about how comparable different estimates were. The confidence intervals from Sandstrom and Harwood should be doubled to standardize to 95% confidence intervals, rather than 68%. Different components of the population were estimated by different studies, and this should be clear when referencing the data. A note should be added to the table for data prior to 1987, indicating it is unstandardized, as in Appendix 1 from Sandstrom and Harwood 2002. The summary table from Appendix 1 in working paper # 4 was identified as having the data that should be presented to document a decline in abundance. Exploitation rates should be included in the table.

Stock Trends

Participants indicated that concerns expressed by fishers about stock trends resulted in the initiation of studies on these Dolly Varden. Participants indicated that this should be noted at the start of this section. The term 'fishers' should be used in place of 'fishermen'. Mean length-at-age data presented in the draft report were removed. The change in the method of age estimation after 1990 produced the between-year differences shown in the figure. The increase in the size of spawners, reported in Sandstrom and Harwood (2002), was considered to be important and reflective of reduced fishing pressure resulting from the closure of the fishery. Cohort strength is variable and is important in terms of long-term expectations for the stock. The age-frequency histograms reflect the variable cohort strength and should be included. The length-frequency histograms were not needed. The data on sex ratios and age at maturity were not relevant to trends, and should be moved to the species biology section. There was also some concern expressed that the data presented in Table 1 were not from random samples.

Habitat Trends

Participants agreed that there should be a separate section on habitat trends, and it should precede the section on sustainable harvesting rate. There might be some overlap with the 'View of the Fishers' section. This section should include the information on changes in water levels and salinity and on increased seismic activity. Precipitation and water chemistry records to support this section were to be added following the meeting.

Sustainable Harvesting Rate

Typically, the sustainable harvesting rate is estimated to be 10%. However, it was pointed out that the rate should probably be even lower for *Salvelinus* species.

Sources of uncertainty

Fishing may not have been the only cause of the decline in the stock. Even with reduced fishing pressure, the stock has been unable to recover. Changes to pool structure (fewer and shallower pools) and lower water levels were identified in both scientific and traditional ecological knowledge reports as recent habitat changes. The extent of habitat change that has occurred and how this could limit stock recovery is not known. Erosion and sedimentation occur, but it is unclear if these have changed with time and how they might affect the spawning beds.

No current stock size estimates and no harvest estimates for the mixed stock fishery in 2001 and 2002 are available. The present day contribution of the Big Fish River stock to the mixed stock fishery at Shingle Point is unknown. Fishers wondered about the Shingle Point fishery and how it fits in with the discussion of the Big Fish River. There was some concern that the contribution was being over-estimated, and that the fishery at Shingle Point was made up primarily of stocks from further west. The estimate of 50% Big Fish River and 50% Babbage River stocks at Shingle Point came from tagging studies carried out in the early 1990s. Analysis of Shingle Point otoliths for strontium might help to resolve some of the uncertainty on this issue.

Outlook

Despite traditional fisheries management measures being taken (closing the fishery to reduce exploitation rate, reopening with a limited quota, monitoring harvest levels and biological parameters of the harvested fish), the stock has not recovered. The fishery has been closed to all but the small mixed stock fishery on the coast. Something is limiting the capacity for recovery, and both biologists and fishers agreed that it is most likely habitat changes, although the opinion was also voiced that historic fishing may have contributed to the stock now being at a point too low to rebuild. There is no empirical evidence to support this or alternative management strategies to address this. Some concern was expressed that some of the changes may be the result of environmental variability. The extent to which habitat changes may occur in the future is not known.

Management Considerations

This section should include mention of the Inuvialuit Final Agreement. It should also include information pertaining to the West Side Working Group. Development of a Fisheries Management Plan is in progress. The Aklavik Inuvialuit Community Conservation Plan was prepared by the community of Aklavik, the Wildlife Management Advisory Council and the Joint Secretariat, and should also be included. This plan has designated the Fish Hole and riparian areas of the Big Fish River as Management Category E, and the remainder of the watershed Management as Category D. Category E is described as, "Lands and waters where cultural or renewable resources are of extreme significance and sensitivity. There shall be no development on these areas. These lands and waters shall be managed to eliminate, to the greatest extent possible, potential damage and disruption. This category recommends the highest degree of protection". Category "D" is described as, "Lands and waters where cultural or renewable resources are of particular significance and sensitivity throughout the year. These areas shall be managed so as to eliminate, to the greatest extent possible, potential damage and disruption."

The correct citation for the plan is:

Community of Aklavik, the Wildlife Management Advisory Council (NWT) and the Joint Secretariat. 2000. Aklavik Inuvialuit Community Conservation Plan, A plan for the conservation and management of renewable resources and lands within the Inuvialuit Settlement Region in the vicinity of Aklavik, Northwest Territories. Inuvik, NT. 155 p.

Other considerations

Participants decided that the comments from paragraph 3 of the Rat River Dolly Varden SSR regarding habitat alteration and development activity should be included here.

The Babbage River Stock Status Report

Background

Participants agreed that changes similar to those made in the Big Fish River Background section would have to be made, e.g. adding the Inuvialuit Final Agreement and the West Side Working Group. The spawning and over-winter site description required changes with the final wording to be worked out later. The Fish Hole includes three creeks. The SSR should indicate that the Babbage River forms the eastern boundary of Ivvavik National Park, and Parks Canada has co-management responsibilities within the Park.

Map

As with the review of the Big Fish River SSR, the participants were not satisfied with the map in the draft document. A list was made of what was to be added or changed on the map. It was suggested that the Canoe River, Fish Hole Creek, Wood Creek and Babbage River should be named. Mid River and Caribou Creek could be removed. The weir site, falls and the Fish Hole site should be marked on the map, along with Firth River, Shingle Point, Ptarmigan Bay and Phillips Bay. Ivvavik National Park boundaries should be included. Vuntut National Park does not include any of the Babbage River watershed, and therefore does not need to be included. Herschel Island should be on the map and identified as a Territorial Park. The Inuvialuit Settlement Region boundaries should be marked on the map as well. There is a water gauge on the Babbage River that should be marked if this information is mentioned in the report.

Species Biology

The first paragraph should refer to 'life history forms' rather than 'types'. It was agreed that the section from the Rat River RAP should be included here as it was in the Big Fish River SSR. The list of rivers containing Dolly Varden should be the same in all three reports. Which rivers to be included came under discussion, as it was pointed out that Fish Creek and the Blackstone River both contained Dolly Varden, but were not included. The size of the watershed should be qualified by the statement that it is the watershed above the water gauge. The water gauge is located on the river at 68° 50' 21" N, 138° 40' 06" W. It was agreed that, to avoid confusion, the fish hole would be referred to as the Babbage Fish Hole. The description of the spawning and over-wintering sites (Canoe River, Fish Hole Creek and Wood Creek) needed clarification. There was no information on young-of-the-year fish specific to this stock. The remainder of the description seemed consistent with field data from the Babbage. The information on the use of Phillips Bay by young fish and the general habitat description required references. Specific information on age-at-first-maturity requires clarification. Based on the limited strontium data, males mature at 6 years and females at 7. This is contrary to what is stated in the draft SSR. Inclusion of residual males may change the age at maturity for males. A better reference to the age of maturation material is needed. Sex ratio information should be included if it is available, and should be included under biology, rather than stock trends. Any information specific to spawning frequency for this river should be added. There are no data yet from micro-PIXE analysis of otoliths from this stock.

It was pointed out that we have ignored what happens to these fish while they are in the ocean. We should indicate that movements in the ocean are not well understood, but Dolly Varden seem to migrate for significant distances along the coast. No direction was added, since migration patterns are unknown.

The existence of an isolated population above the falls should be indicated as was done with the Big Fish River stocks. The isolated population differs genetically from the anadromous population, but it is not dealt with further in the report.

The Fishery

Historical harvest

Information from the Traditional Ecological Knowledge Study provided domestic fishery information prior to the 1950s. The community at Herschel Island used this stock. All the domestic historical information was combined and presented first, followed by the information on the small commercial fishery. It was pointed out that, although the commercial fishery was identified as being at Herschel Island, the fish were boxed and shipped from Shingle Point (this was the base), as was indicated in the Traditional Ecological Knowledge Study. It should be noted that Alaskan fish are also caught in the coastal mixed fishery. Commercial fishery catch weights were rounded. Historically, the stock was also used by the Gwich'in,who had a camp below the falls. People stopped to fish while they were on their way to Aklavik to pick up supplies. Historically, people from Old Crow harvested from the Babbage stock.

Current harvest

Current harvest information was discussed, and it was decided that the information available did not warrant a table. The harvest from Shingle Point and King Point should be included with the information available on the proportion of the catch originating from the Babbage River. The hypothesis is that the Babbage stocks contribute about 50% to the mixed stock harvests along the coast. Clarification on where the 50% came from should be included. Some of the calculations relating to the sustainability of the harvest were in error in the draft report and had to be updated. Some of the references were also incorrect and had to be checked. It was pointed out that there are fish caught that are not reported, including by some fishers from Inuvik, so that the numbers reported are always an underestimate of the true harvest. Some sport fishing occurs on the river, however the numbers caught are quite small.

View of Fishers

This section was drafted by the members of the WSWG and was to include a summary of the importance of the fishery to local people.

Resource Status

Stock Delineation

There was some discussion about the tag results mentioned in this section. If a better statement or more recent data can be found it should be incorporated.

Stock Size

The single estimate used in the draft report was incorrect and was revised.

Stock Trends

Participants agreed that a statement should be included here to indicate that there are no abundance estimates from which trends in abundance could be determined. The estimate extrapolating abundance from the spawning and nursery area was not considered credible as the basis for reporting a trend in abundance. There was discussion concerning whether or not to include a growth curve as a figure. Since the data are for one year, rather than more, there would not be a trend. If this were the case, the information would be better presented under species biology. If there was information available with which to produce a growth curve, then it should be added to the report. With only 3 years of length data, it is difficult to say anything, although length data are stable over these years. The figure from Sandstrom *et al.* (1997) is better than that in the draft SSR and should be used. Modal length information should be removed. Following some discussion, it was decided that the residual male information was not needed in this section. Discussion clarified that the age distributions came from a single study over three years (rather than from several studies with varying sample protocols), and could be included in this section. Age at maturity information should reference Sandstrom 1995.

The inclusion of sex ratio information was discussed. The draft report does not distinguish between residual and anadromous males. The percentage of males was about 45% from 1991 to 1993 (Sandstrom 1995), and Bain's study (1974) reported about 40% males, so the sex ratio has been fairly stable over time, and should be indicated.

Sustainable Harvesting Rate

The Sustainable Harvest Rate presented in Table 3 of the draft SSR was incorrect. Changes were made to reflect the coastal harvest estimate of 50% of 250 (rather than 500 fish). As a result of this change, the calculated exploitation rate (using the maximum exploitation rate from 1999 and the population estimate) is under 5%. Averaging from 1988 to 1999, the total removal would be under 0.5%. There was some discussion about whether to use the table or text, and the decision was made to keep the table and omit the text. A discussion of the instantaneous mortality rates calculated from mark recapture data ensued. Survival was estimated at 75%, but a safe level might be closer to 60%. An exploitation rate of 5 to 10% would remove 540-1080 fish annually. This calculation is based on the instantaneous natural mortality rate (M) of .28 from an unexploited stock and the 1991 abundance estimate. The calculations should be appended to the proceedings. As in the Big Fish River Stock status report, the reference to sustainable harvest levels for Arctic char was to be removed.

Sources of Uncertainty

Participants listed the sources of uncertainty as lack of recent data for this population and for Dolly Varden in general. Specifically, there are no recent

population estimates, no estimate of the total mixed stock fishery or the contribution of the Babbage River Dolly Varden to any mixed stock fishery. Harvest records are incomplete and there is no information on habitat changes, stock trends or fishing effort.

Outlook

In general, it was decided that the population would not likely be overexploited with the current suspected low level of harvest; however there was still concern that the population might be vulnerable to harvest level increases or habitat changes. It was recommended that the age of the data set be recognized, i.e. the most recent data are 10 years old.

Management Considerations

Information included in the Big Fish River SSR should also be included here. Participants wondered if there is the potential for increased fishing on the Babbage as a result of the decline in the size of the Big Fish River stock. Fishers might be looking for alternative sources of Dolly Varden. If there was to be increased exploitation, it was pointed out that collecting data on this stock prior to exploitation would provide significant understanding of how an unexploited stock responds to fishing. It was pointed out that the harvest practices of fishing on the spawning and over-wintering grounds that occurred in the Big Fish River should be discouraged in the Babbage River. Information on the timing of harvest from the Big Fish River report should be included here.

Other Considerations

The caution concerning industrial development from Big Fish River SSR should be included here. Water gauge information should be included, and the information on glaciation should be added.

Firth River Stock Status Report

Prior to reviewing the draft SSR for the Firth River, participants discussed whether or not two stocks were present in the Firth River system. The suggestion has been made that Dolly Varden that spawn in Joe Creek, a tributary of the Firth River, are a separate stock from those that spawn in the Firth River itself. Morphological evidence and otolith micro-PIXE analysis from the working papers supported differences between the fish found in both areas, however the genetic analysis discussed in working paper #8 does not. Without the support of the genetic analyses, participants were reluctant to call the Joe Creek Dolly Varden a separate stock. It was decided to treat them as a single stock because the data are equivocal as to whether they are distinct or not. It was also pointed out that in Alaska, for example, a stock is defined by fishery criteria, not genetics, etc. If they are likely to be managed as a unit, they would be considered one stock. It was decided that regardless of where the fish spawned in the system, they would normally be managed as a single unit.

Background

The reference to Joe Creek being a separate stock was to be removed from the draft SSR. Participants agreed that changes similar to those made in the Big Fish River 'Background' section would have to be made, e.g. adding the Inuvialuit Final Agreement and the West Side Working Group. The river system is within the boundary of Ivvavik National Park, and Parks Canada has co-management responsibilities within the Park. This information should be added. It should be noted that a portion of the headwaters of the Firth River and Joe Creek are in Alaska, within the boundaries of the Arctic National Wildlife Refuge.

Map

As with the previous SSR, the participants were not satisfied with the map in the draft document. It was decided that some of the area in Alaska should be cropped, and the Arctic National Wildlife Refuge should be identified. A list was made of what was to be added or changed on the map. It was suggested that the Babbage River, Joe Creek, Komakuk Beach and Nunaluk Point should be named. The spawning sites and sampling sites should be marked on the map, along with Ivvavik National Park boundaries. Herschel Island should be on the map and identified as a Territorial Park. The Inuvialuit Settlement Region boundaries should be marked on the map as well. There is a water gauge and water sampling site on the Firth River that should be marked. The water shed area used in the text is calculated for the watershed above the water gauge site. The types of data being collected at the water gauge site, as well as where it is available, should be identified.

Species Biology

Participants indicated that this section should be consistent with other SSRs. It was agreed that the general species description from the Big Fish River SSR should be used. Once again, it was pointed out that a note regarding older scientific literature referring to these fish as Arctic char should be included somewhere in this section. The number (2 or 3) and location of the spawning sites needs to be added. There was some discussion about the accuracy of spawning timing and who should be referenced (Glova and McCart). Data specific to the stock should be included if it is available, rather than using generalizations. Data, including size segregation information (Figure 2), originally presented in the 'Stock Trend' section were moved to this section. The age at 100% maturity was misleading, and resulted either from a small sample size or an artifact, because they are sequential spawners. It was decided that the data from Glova and McCart (1974) should be included (the age of 50% maturity was between ages 7and 8 for anadromous fish). There was discussion about the [illegible] ratios and on size and ages of males and females. This information was removed because of concern over its validity. It was felt that sample sizes were small, and measurements of both anadromous and residual fish [illegible] have been combined,

which would explain the results presented. The term "spring" should be changed to "upwelling", which better describes the water source.

The Fishery

Historical harvest

Participants agreed that this section is similar to that in the Babbage River SSR, and the two should be consistent. In the Traditional Ecological Knowledge report, there is information on harvesting from the Firth River during people's travels. Some participants wondered if people living on Herschel Island would have used the Firth River. Participants from Aklavik indicated that this was not likely, because the Babbage was the preferred travel route for people traveling from the coast to Old Crow. There is no information on the amount of any historic harvest of the Firth River stock. There would have been a mixed stock fishery and some fishing on the river at the Fish Hole, which is substantiated by the Traditional Ecological Knowledge Study. It also indicates that the channels were used for fishing. Information from the 'Views of the Fishers' section about historical use patterns would be appropriate here as well.

Current harvest

Since most of the information is not recent, the wording for this section required changes to reflect this. Harvesting occurs at Herschel Island (now a territorial park) but, as of yet, we don't have good estimates of numbers. The park is preparing a management plan and will be monitoring catches in the future. There are indications that as many as 300 fish were caught this year. Aklavik harvesters noted that some young fishers took over 200 fish. It is assumed that 'Canadian' fish are caught in Alaska, however the number taken is unknown. There was some discussion about the proportion of 'Canadian' fish in the Alaskan harvest based on genetics and maximum likelihood estimates, and what the reported percentages mean. It was decided that numerical estimates should be taken out and replaced with 'some'. Within Ivvavik National Park, Parks Canada issues sport fishing licences and regulates sport fishing. A sports angler survey for 2002 indicates that about 32 fish were caught this year (24 reported and an additional 8 were estimated with 75% response rate by anglers).

View of Fishers

This section was drafted by the members of the WSWG and was to include a summary of the importance of the fishery to local people.

Resource Status

Stock Delineation

After some discussion, it was decided that the statement in the SSR that Joe Creek and Firth are different stocks had to be changed. Based on the genetics data presented, there is difficulty in assigning Firth and Joe Creek Dolly Varden to different stocks, although there is an indication that there are some genetic differences. It was suggested that the wording should capture the idea that there are differences between these fish, but that the evidence is not strong enough to say that these are two stocks. There are significant differences in both morphometrics and otolith microchemistry between these two groups. They are distinct from other North Slope stocks in other river systems. The overriding factor, however, is that the Firth and Joe Creek fish would not be managed separately. It was agreed that they would be kept together within the single SSR, which would be titled "Firth River Dolly Varden".

Stock Size

Although there are numerous attempts to estimate the population, none were considered to be valid or reliable. Past estimates are not comparable because they all used different methods, and were done at different times during the year. In the aerial surveys, grayling cannot be distinguished from Dolly Varden. After discussion, it was concluded that there is no reliable estimate of the number of DV in this system and, as a result, Table 1 would be omitted.

Stock Trends

There are no data on which to base any conclusions about stock trends. It was decided that all the information contained in this section in the draft SSR should be moved to species biology.

Sustainable Harvesting Rate

As in the previous SSRs, the reference to Arctic char was removed.

Sources of Uncertainty

There were no reliable stock size estimates for the Firth River stock. In addition, other sources of uncertainty, described in the Babbage River report, were to be added to this section. Sustainable harvest levels are also sources of uncertainty.

Outlook

The term 'exploitation' was removed from the draft. Participants indicated that harvests from the Firth River stock could increase because people stop there during traveling, and park visitors and employees use the Firth for sport fishing. There is the national park (Ivvavik National Park) and a territorial park at Herschel

Island where Firth River fish can be caught. Both Inuvialuit and Alaskan Inupiat travel back and forth along the coast, and may stop to fish. There is also the potential for higher Alaskan harvests, which would impact the stock from this river system.

Management Considerations

Jurisdiction information from the Babbage material should be included with the addition of material pertaining to Alaska. It is unclear if the river system is safe from development on the American side of the border, although it is protected in Canada. The river is within Ivvavik National Park, which ensures that development will not occur in Canada, but political changes in the US could change the protective status of the Arctic National Wildlife Refuge. Although being situated in the ANWR should ensure protection, it is not clear that it will. Older referenced material should be removed. Information included in the Babbage River SSR should also be included here. Timing of harvest information from the Babbage River report should be included here, however, no one currently fishes the spawning and over-wintering sites, so this information can be brief and moved to the end of the section. Information on coastal fisheries was revised to indicate that the composition of mixed stock fisheries is mostly unknown and highly variable.

Other Considerations

The caution concerning industrial development from Big Fish River SSR should be included here. The water gauge on the river may provide data on historic water levels.

Concluding Remarks

For all three SSRs, the participants agreed the photographs of the male and female Dolly Varden on the net best illustrated the species, and should be used in the SSRs. If possible, a length scale should be added to the photographs. The contact person for all three reports will be Sam Stephenson. References are to be checked once the draft is revised.

Further revisions, not completely worked out during the meeting, were to be made by mid-December. The revised draft would then be sent to participants for review and approval, with comments being returned by the end of January. The target date for completion of the final SSRs would be prior to the WSWG meeting, scheduled for the second week of March 2003.
The meeting was adjourned at approximately 5:00 p.m.

References

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Appendix 1. Participants List

Participant	Affiliation
Aviugana, Donald	Aklavik HTC and WSWG
Ayles, Burton	FJMC and WSWG
Babaluk, John	DFO, Arctic Science
Bajno, Rob	DFO, Arctic Science
Bill, Kevin	FJMC and WSWG
Cosens, Susan	DFO, Science – Stock Assessment
Gordon, Danny C.	Aklavik HTC and WSWG
Harwood, Lois	DFO, Science – Stock Assessment
Kasook, Pat	Aklavik HTC
Kotokak, Max	FJMC
Martin, Kathleen	DFO, Science – Stock Assessment
McDonald, Ian	Parks Canada and WSWG
Sandstrom, Steve	External Expert (presently MNR, Ontario)
Stephenson, Sam	DFO, Fisheries Management & Environmental Science
Tallman, Ross	DFO, Science – Stock Assessment

HTC	Hunters and Trappers Council
DFO	Fisheries & Oceans Canada
FJMC	Fisheries Joint Management Council
MNR	Ministry of Natural Resources
WSWG	West Side Working Group

Appendix 2. Central and Arctic Regional Advisory Process (RAP)

What is RAP?

The Department of Fisheries and Oceans (DFO) has the mandate to manage and conserve Canadian marine and freshwater aquatic resources and their habitat. This mandate requires that DFO provide technical knowledge and advice to management and regulatory agencies within DFO and elsewhere on the conservation requirements of these resources. The "Regional Advisory Process" or "RAP" is used to review information on fish, invertebrate and marine mammal stocks and assess their status. The Canadian Science Advisory Secretariat (CSAS) is the national body that facilitates these regional reviews, develops national standards, promotes the exchange of ideas about the review and advisory processes and coordinates communication of assessment results. Reports on the status of fish, invertebrate and marine mammal stocks, environmental and ecosystem overviews, research documents featuring detailed scientific information, as well as Proceedings of peer review meetings are available from CSAS or, in many cases, can be downloaded from their web site.

The principles that guide the RAP are as follows:

- the assessment schedule is to be timely, responsive and flexible to client needs,
- scientific information should be based on the most appropriate and credible scientific methods,
- traditional and local resource-user knowledge should be incorporated into the review process,
- technical reviews should cover the full range of regional resource management issues,
- the review process should include not only DFO Science personnel but also resource managers and stakeholders and outside scientific experts,
- the document trail should be visible and public.

The Regional Advisory Process is meant to provide a consistent and inclusive approach to resource assessment. Stocks are identified for a stock assessment process by an interactive priority setting process between co-management boards and DFO. The products of the RAP are for both client and public use and are to be written in simple language and prepared in a timely manner.

RAP Meetings

RAP meetings provide the scientific basis for providing advice on the regions' marine and freshwater resources, and their habitat to fisheries managers. A RAP meeting should:

- review all pertinent scientific information and traditional ecological knowledge contributed by participants, and conduct such analyses as may be required to establish the status of stocks and their habitat
- provide a forum for discussing the biology of the stocks and their habitat; examining methods used to estimate abundance, potential yields, safe conservation levels, and assessing responses to habitat alteration

- produce a consensus interpretation of each agenda item wherever possible but where consensus cannot be reached, the merits and short-comings of alternative interpretations are to be discussed and specified appropriately (see *RAP Documents*)
- present a clear summary of the state of knowledge and information on the stock and provide an evaluation of stock status in a Stock Status Report (SSR)
- document the deliberations and discussions in the form of a Proceedings

Attendance at RAP meetings varies in relation to the issues being discussed and can involve experts from DFO, outside agencies, aboriginal Land Claims boards and committees, resource users, First Nations, stakeholders, universities, and other government departments, who can provide meaningful input to the review process. These participants provide the nucleus of the peer review. As well, meetings are open to any interested party as observers. All participants, except for observers, are allowed to participate in the discussion and formulation of the final products. The chairpersons make the purpose of each meeting clear, what is expected from participants, the place of RAP in the overall management process, and the status of the material under consideration. Participation of the media is at the discretion of the meeting chair.

Outside scientists or agencies can present scientific papers or traditional knowledge to a RAP meeting for peer review. However, if such a paper is presented to a RAP meeting, the outside scientists are expected to remain at the RAP meeting for the full meeting rather than present the paper in question and then depart. Such papers are to be submitted to the meeting chair two weeks in advance of the meeting with a request that they be peer reviewed at the meeting, and not tabled the day of the meeting with the expectation that it will be peer reviewed.

Routinely, individuals are not paid to attend RAP meetings, however there is provision for travel of resource users and outside experts who have been invited to the meeting.

RAP Documents

Working Papers

Working Papers are DFO Central and Arctic documents that have been reviewed by at least one individual prior to presentation and review at a RAP meeting. All documents presented and reviewed at RAP meetings will be considered Working Papers and, unless specifically approved by the author, are not for wider distribution. The RAP Coordinator or the meeting chairperson will assign numbers to the Working Papers. A list of Working Papers will be made available at the start of every RAP meeting. These documents have no status outside the meeting.

Research Documents

Research Documents record the technical basis of the status reports from meetings or workshops. Research Documents are produced within two months of the last day of the meeting at which they were considered. They are generally

revised Working Papers which have been approved for inclusion in the Canadian Science Advisory Secretariat (CSAS) Research Document series. Final documents are available to the public from the CSAS.

Stock Status Reports

Stock Status Reports (SSRs) are documents that contain clear, concise and jargon-free information on the status of a stock and summarize the conclusions of the RAP meeting about the status of the stock. Draft SSRs are submitted by authors to the RAP coordinators for review at least 2 weeks before the scheduled RAP meeting (or four weeks, if translation is required). Draft SSRs are revised based on discussions at the RAP meeting. Where there is more than one interpretation of specific analyses or of overall stock status, the alternative interpretations should be included in the SSR, with a brief presentation of the information supporting or contradicting each alternative. Final content of the Status Reports, as well as wording, is to be agreed upon prior to the conclusion of the RAP meeting. It is acknowledged that post-meeting technical editing may be required to improve readership and format. Any such changes must be made without changing the scientific content and meaning within the document. Any proposed changes to the document must be circulated to RAP meeting participants for comment and approval prior to finalization of the SSR. SSRs will normally be revised and distributed for final review within two weeks of the conclusion of the RAP meeting. After the editing has been completed, the Regional Science Director signs off the report and it is released. The RAP coordinator publishes and distributes the Stock Status Reports. The electronic form is entered on the Fisheries and Oceans Canada Internet site (http://www.dfo-mpo.gc.ca/csas/), as part of the national series co-ordinated by CSAS.

Proceedings

Proceedings are the official record of a RAP meeting and are produced by the meeting chair within two months of the last day of the meeting. Proceedings include the main points of discussion, contentious issues and consensus positions on each issue. Where there is more than one interpretation of the available data, the Proceedings should present the discussion of evidence supporting or contradicting each alternative, highlight the consequences of the alternatives to the interpretation of stock, habitat or ecosystem status and, where relevant, identify the proponents of the alternative interpretations. Dissenting opinions may be included in the Proceedings as "Minority Statements", included exactly as written by any RAP participant who wishes to submit them. Recommended modifications to the originally tabled analysis are to be noted. A list of participants, the meeting Remit and Agenda, a list of Working Papers (along with which working papers are to be upgraded to the Research Documents), and research recommendations are to be included as appendices. Minority reports (if any) can also be referred to in an appendix.

Appendix 3. Meeting Remit

The meeting will focus on an evaluation of stock status for the status of the *Firth River and Joe Creek Dolly Varden*, the *Babbage River Dolly Varden* and the *Big Fish River Dolly Varden.*
The following topics will be reviewed:

1. **Background**
   - *the context for the review (the reason for a stock status evaluation) and a brief overview of the stock (description of its range, and its importance and use as a resource)*

2. **Species Biology**
   - *a short species description (morphology, growth and size) and a brief overview of relevant life history (distribution, movements, reproduction, sources of mortality, and feeding)*

3. **The Fishery**
   - *a description and summary of the fishery, including the total estimated annual harvest*

4. **Resource User Perspective**
   - *a description of the cultural and traditional importance of the resource*

5. **Resource Status**
   - *knowledge of stock-specific data and parameters related to an evaluation of stock delineation, stock size, stock trend, and sustainable fishing rate*

6. **Sources of Uncertainty**
   - *identification of specific parameters and/or stock assessment procedures that may contribute to uncertainty in measures of resource use or resource status*

7. **Outlook**
   - *a statement on the outlook for the stock, based on a review of its current status, trend, and foreseeable events*

8. **Management Considerations**
   - *identification of factors that may affect the management of the fishery, including a review of current fishing and management practices, as well as implications of Fishing Plans already in place*

9. **Other Considerations**
   - *other factors that may affect the future health and status of the resource, such as industry, habitat effects, contaminants, and disease*

Appendix 4. Proposed Agenda

Wednesday, 6 November 2002

8:30 Welcome and Opening remarks (Susan Cosens)

8:35 Introduction (Susan Cosens, Kathleen Martin)

- A description of the Regional Advisory Process
- Overview of the draft documents for review
- Chairperson remarks: review and revise agenda as required

9:00 Working Paper # 9 Micro-PIXE analysis of Dolly Varden otoliths (John Babaluk)

9:15 Working Paper # 1 Traditional Ecological Knowledge Study (Kevin Bill)

9:30 Begin review of Big Fish River Stock

- Background (9:30)
- Species Biology (10:00)

10:15 ——— 15 minute break ———

10:30 Continue Review of Big Fish River

- Species Biology (10:30)

10:45 Working Paper # 7 Big Fish River Studies (Steve Sandstrom)

11:00 Working Paper # 5 Historic and Current Trends (Big Fish)
(Sam Stephenson)

11:15 Continue Review of Big Fish River

- The fishery (11:15)

11:45 ——— 1 hour lunch break ———

12:45 Continue Review of Big Fish River

- The fishery (12:45)
- Resource User Perspective (1:00)

2:00 Working Paper # 8 Genetic Stock Structuring (Rob Bajno)

2:15 Working Paper # 10 Morphological Data – Stock Structure (Kathleen Martin)

2:30 Continue Review of Big Fish River

- Resource status (2:30) (related discussion-should we do a separate stock status report for Joe Creek?)

2:45 ——— 15 minute break ———

3:00 Continue Review of Big Fish River Stock

- Resource status (3:00)
- Sources of Uncertainty (3:15)
- Outlook (3:30)
- Management Considerations (4:15)
- Other Considerations (4:30)

4:45 Closing remarks for the day

5:00 Adjourn until Thursday, unless backlog in addressing agenda items, in which case evening session will follow at 6:30 until 9:00

8:30 Review of any revisions to SSR drafted since yesterday; review of Proceedings notes from previous day

9:00 Begin Review of Firth and Babbage River Stocks

- Background (9:15)
- Species Biology (9:45)
- The fishery (9:50)

10:15 ——— 15 minute break ———

11:00 Continue Review of Firth and Babbage River Stocks

- Resource User Perspective
- resource status (11:15)

11:45 ——— lunch break ———

12:45 Continue Review of Firth and Babbage River Stocks

- Sources of Uncertainty (12:45)
- Outlook (1:15)
- Management Considerations (1:45)
- Other Considerations (2:15)

2:45 ——— 15 minute break ———

3:00 Review maps and images for use in Stock Status Reports; Identify remaining text to be reviewed, issues to be resolved; Complete discussions of remaining items identified earlier; Set time-table for document revision and final review;

5:00 Adjourn meeting

Appendix 5. List of Working Papers

WP#1 West Side Working Group. 2001. Traditional Ecological Knowledge Fishing Study – working draft.

WP#2 Eddy, J.B., J.D. Reist and C.L. Evans. 2001. Status and trends of the Firth River and Joe Creek Dolly Varden stocks. Draft Working Document.

WP#3 Eddy, J.B., J.D. Reist and C.L. Evans. 2001. Status and trends of the Babbage River Dolly Varden stock. Draft Working Document.

WP#4 Eddy, J.B., J.D. Reist and C.L. Evans. 2001. Status and trends of the Big Fish River Dolly Varden stocks. Draft Working Document.

WP#5 Stephenson, S. 2002. Historic and current status of Dolly Varden in the Big Fish River: 1997-2001. Draft Report.

WP#6 Parks Canada. 2002. Ivvavik National Park Visitor Statistics and recreational angling survey. Preliminary data tables.

WP#7 Sandstrom, S.J. and L.A. Harwood. 2002. Studies of anadromous Dolly Varden (*Salvelinus malma)* (W.) of the Big Fish River, NT, Canada, 1972-1994. Can. Man.Rep.Fish.Aquat.Sci.2603:vi + 31 p.

WP#8 Bajno R. and J.D. Reist. 2002. Evidence for Genetic Stock Structure of the Dolly Varden of the Alaskan and Canadian North Slope. Draft Report.

WP#9 Babaluk J.A., C.L. Evans and J.D. Reist. 200X. Micro-PIXE analysis of strontium and zinc distributions in Dolly Varden, *Salvelinus malma*, otoliths from northwestern Canada and Alaska: retrospective determination of life history traits. Can. Tech. Rep. Fish. Aquat. Sci. (in prep.)

WP#10 Johnson J., 2002. Stock structure of North Slope Dolly Varden char based upon analysis of morphologic data. Draft Report.

Appendix 6: West Side Working Group (WSWG) Work Plan Update
Nov 5, 2002, Aklavik

Purpose: This general workplan that outlines the tasks for the West Side Working Group. It will be used to guide our work, to inform others of what we are doing and as a basis to request money to support the work. This workplan was prepared for discussion at the first formal meeting of the WSWG in Aklavik, June 11, 2001 and approved at the October 16, 2001 meeting. It will be updated and modified at each meeting.

Background: This workplan follows on from work already completed prior to the formal establishment of the WSWG by the Aklavik HTC, FJMC, DFO and PC. It is based on a preliminary DFO framework for developing what DFO calls, "Objective-Based Fisheries Management Plans". The framework that DFO is working on will be the basis for their "Fisheries Management Plans" on the Atlantic and Pacific coasts. DFO has stressed that in the Inuvialuit Settlement Region, and in other areas where co-management regimes have been established, this DFO framework does not have to be followed. It is up to the co-management partners to develop a process that matches their needs.

Workplan for WSWG

Steps	Planned Tasks	Responsibility	Date	Comments
1. Establish WSWG	• Formal agreement between HTC, FJMC, DFO and PC to establish working group.	HTC, FJMC, DFO, PC	Jun /02	June 2002 all groups have now approved TOR
	• Develop terms of reference for group			Done
	• Identify working group members			Done
	• Identify chair for WSWG	WSWG	Oct 16/01	Carol Arey named by HTC Oct 16
	• Develop workplan	WSWG	Jun 11/01	Approved Oct 16
	• Develop planning budgets	WSWG	Jun 11/01	Modified Oct 16
	• Community Review	WSWG	Jan 23/02	Proposed for time of TEKFS report
	• Others?	HTC members	Jan 23/02	
	• Appoint new HTC member	Aklavik HTC and WSWG	Nov 6/02	Carol Arey has left. Need HTC member and need to elect a new chair for committee
2. Assemble Background Information on WS stocks	• Identify preliminary issues and concerns	WSWG. Review by agencies and HTC	HTC review June 18	Ongoing may be modified at any time
	• Assemble and analyze scientific knowledge	DFO Science	Oct 16/01	Draft reports on char completed by DFO will now
	• Char			

				undergo scientific review and then community review. Community review Nov /02
	• Grayling		Feb 2002	Bibliography complete Feb 11. PPT presentation needs minor revisions But RAP not prepared
	• Habitat repeat Stabler study and review with community		Nov /02	Funding approved for Stephenson for Oct 2002 study. Maps and full report from Stabler now found
	• Assemble and analyze TEKFS • Develop outline	WSWG, HTC	Oct 16 Done	
	• Contract to facilitator		Feb Done	Richard Papik contracted. Melissa Marschke assisted.
	• Carry out interviews		Mar /02	Richard and Melissa completed interviews
	• Report to community	WSWG	Mar 15/02	Community review of TEK completed
	• Final TK report	WSWG	April 19/02	Submitted by Melissa for review June 7/02
			Nov /02	TEKFS input to RAP process. Ayles to redraft report as FJMC report.
	• Review scientific knowledge and TEKFS for completeness	DFO, WSWG, HTC members	Nov /02	
	• Community Review • Others?		Nov 02	DFO review of

				RAP with community members. Will include TEK report Will take place in Nov/02.
3. Setting Conservation Limits for WS Stocks	• Establish what basic requirements are to ensure that the WS stocks are maintained for future generations i.e. biological requirements such as size of spawning population, habitat needs etc; • Identify knowledge gaps • Prepare stock status reports • Community Review • Others?	DFO Science & WSWG Science DFO Science WSWG	2002 Nov 2002	Following DFO science RAP process Need to start to discuss this in spring. RAP process
4. Setting Fisheries Management Objectives and Fisheries Management Strategies for WS Stocks	• Establish biological objectives – ensuring that conservation limits from step 3 are met in the long term • Establish social, cultural and economic objectives (harvest objectives) what we want in terms of domestic, recreational and commercial harvests for WS stocks • Community Review of objectives • Achieve consensus on the most appropriate fisheries management strategies to realize the objectives • Others?	DFO Science with input from WSWG and Aklavik WSWG, HTC, FJMC, DFO Fish Mgmt, PC, WSWG HTC members of WSWG WSWG and DFO Fish Management	Initiate June/02 Complete in 2002	Should start with the Nov 2002 meeting especially important for community input WSWG needs to start to discuss what we want for these stocks.
5. Develop the Fisheries Management Operational Plan	• Develop community fishing plans and enforcement plans, science plan, data collection plans, habitat plan, communication plan etc • Community Review • Others?	WSWG, HTC, DFO Fish Mgmt WSWG WSWG	Initiate in 2002	Follows after we decide what we want from the WS stocks and after we have reviewed this with the communities
6. Plan Implementation	• Formal sign off of plan • Others?	HTC, DFO, FJMC, PC		
7. Review	• Periodic review and modifications if necessary • Others?	FJMC,HTC, DFO		